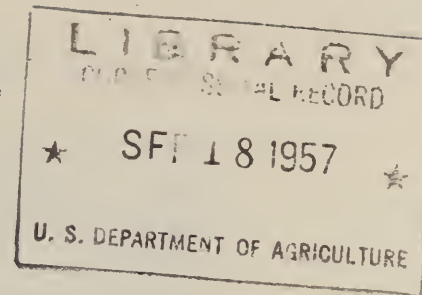


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UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
ANIMAL DISEASE ERADICATION BRANCH
WASHINGTON 25, D. C.



August 3, 1954

ADE BRANCH MEMORANDUM NO. 505.1

To : All Branch Stations and State Livestock Sanitary Officials
From : Dr. R. J. Anderson, Chief,
Animal Disease Eradication Branch
Subject: Instructions for the use of the wettable powders of
benzene hexachloride (BHC) and lindane in the
treatment of scabies.

I PURPOSE

Inasmuch as care must be exercised in dipping animals and in maintaining the bath at the standard concentration when these wettable powders are employed the purpose of this memorandum is to furnish detailed instructions for the guidance of employees who may be called upon to use them in scabies eradication work.

II HANDLING OF ANIMALS PRIOR TO AND DURING TREATMENT

Avoid rough handling of animals prior to, during, and following treatment. After driving animals to the vat, allow them to rest and cool off before dipping. Animals should not be hungry or thirsty when they are treated. If they are watered and fed from 2 to 4 hours before dipping, they are likely to be in the best condition for dipping. Before using the facilities, examine the pens, chutes, slide board, and vat for projecting nails, broken boards, or any object that might cause wounds that would be contaminated in the dipping operations.

A gate or bar in the chute near the entrance to the vat holds animals back so that they are less likely to pile up and drown. Weak animals will require assistance in swimming through and leaving the vat. Animals cannot be treated properly if caked with mud or if the hair or wool is matted with filth; all such encrustations must first be loosened to insure effective penetration by the dipping solution.

Prior to dipping, animals should be examined carefully to determine if their physical condition is such that they can undergo dipping without showing toxic manifestations that might result in losses. Some losses might likewise result if the same weak, severely emaciated animals were dipped in the commonly used arsenical, nicotine, and other products. The benefits to be derived from the use of dips should be carefully weighed against losses that might be sustained from dipping animals that are in poor physical condition. However, the possible loss of an occasional very thin or young animal should not necessarily prevent the use of chlorinated hydrocarbon dips for destruction of external parasites.

After animals have been treated with BHC and lindane, they should not be exercised vigorously, packed tightly in corrals, or loaded in cars or trucks until they have had an opportunity to thoroughly dry. In cold weather, animals should not be treated late in the afternoon. Animals treated in the winter should have an opportunity to rest and dry off following treatment, should eat and drink before nightfall, and should have shelter. Rain, following treatment, does not ordinarily interfere with the action of these dips. Animals treated in the summer should be protected from overexposure to hot sunshine immediately following treatment.

III PRECAUTIONS

- A. Infected trucks, trailers, railroad cars, barns, corrals, curry combs, brushes, blankets, and sheep sheering equipment should be cleaned and disinfected.
- B. BHC and lindane preparations that get on the skin or clothing of operators should be washed off.
- C. Splashings from the vat or drainage from the pens should not be allowed to accumulate in puddles. The bath should not be emptied where animals may come into contact with it nor where seepage may reach animal feeds, wells, or springs, nor should it be drained into ponds or streams where fish or animals may be poisoned.
- D. The bath is not ordinarily heated. Animals should not be dipped if the temperature of the bath is more than 80°F.
- E. Do not mix BHC or lindane with other dips such as lime-sulphur solution, nicotine-sulphate solution, or the arsenical preparations; do not alternate the use of these dips.

F. Treat each and every animal in an infected flock or herd regardless of whether it shows symptoms of scabies

G. Hard crusts and scabs on infected animals should be broken with a stiff brush and well soaked with the bath prior to general treatment of the flock or herd.

H. All animals should be completely submerged and the head of each ducked at least once. Infected animals must be held in the vat for a full minute.

I. BHC and lindane are insoluble in water and must be maintained in a suspension for the active ingredient to be effective as a dip. The powders have a tendency to adhere to the sides of the vat and to settle rapidly to the bottom when there is a delay of only a few minutes in dipping. When there is a delay, and before the animals again enter the vat, adhering material should be scraped from the sides and bottom of the vat and the bath vigorously agitated.

J. Only the wettable powders of BHC and lindane, not the oil-emulsions of these products, have been approved for use by the United States Department of Agriculture.

K. Lambs should be dipped separately from larger, heavier sheep. It may be better to hand-dip lambs under 30 days of age rather than make them swim through the vat.

IV CALCULATING THE CAPACITY OF THE VAT

A common mistake in charging a vat is to fail to accurately estimate the volume of water used. This can cause a serious error in figuring the amount of insecticide to be added. The capacity of the vat may be determined as follows:

A. By means of an accurate water meter

B. By counting the number of containers of known capacity that must be emptied into the vat to fill the vat to the desired level.

C. By measuring the vat and computing the gallon volume.

1. Obtain the average length of the vat. Add the length of the bottom to the length of the top (line to which the vat is to be filled) and divide the sum by 2.

2. Obtain the average width the same way.
3. Obtain the depth by measuring from the bottom of the vat to the dip level line.
4. Multiply the average length, in inches, by the average width, in inches; multiply this result by the depth, in inches. This will give the approximate number of cubic inches of space to be filled with dip. Divide this by 231 (the number of cubic inches in a gallon) and the result will be approximately the number of gallons required to fill the vat.

Gauges or rods should be prepared and marked to show the number of gallons at various depths in the vat.

V FILLING THE VAT AND CHANGING ITS CONTENTS

Fill the vat to the proper level with a known quantity of clean water. Add the required amount of wettable powder evenly along the surface of the water, taking care that powder is not lost in the wind. Stir the mixture thoroughly. Keep rainfall and surface water out of the vat.

Since BHC and lindane dips are not bacteriostatic or bacteriocidal it is necessary to change the vat when the bath accumulates filth or becomes contaminated. This stage has been reached when the dip turns dark or blackish, or when gas bubbles are seen rising from the bottom.

Unless the bath is contaminated or filthy, about 3,000 sheep may be dipped in a 1,000 gallon vat and about 6,000 cattle may be dipped in a 2,000 gallon vat by increasing the amount of ingredients added when replenishing the bath. If the bath is filthy, the vat must be completely emptied, including all sediment and other foreign matter, scrubbed, and refilled with fresh contents regardless of the number of animals dipped. In no case should a bath be used that is more than 30 days old. In many instances, particularly in hot climates, the vat must be changed at shorter intervals than the miximums mentioned.

VI TOXICOLOGY OF BHC AND LINDANE

Although toxic reactions are infrequent, they do occur at times, especially when severely emaciated animals are dipped. Benzene hexachloride and lindane are absorbed through the unbroken skin and digestive membranes. Once in the system, they follow the blood stream to all portions of the body and ultimately are deposited in the fat tissues. Emaciated animals and suckling

calves are more susceptible to poisoning by these products than are better fleshed and older animals. Calves of the beef breeds ordinarily are more resistant than dairy type calves of the same age and condition.

When toxic reactors occur, symptoms may be evident within 30 minutes to 48 hours after treatment. First symptoms of poisoning are excessive salivation, persistent lolling of the tongue, grinding of the teeth, rolling of the eyes, and mild nervous disturbances such as dullness, muscle twitching, and abnormal activities, or hyperexcitability. These symptoms may be followed by either marked depression or violence, and the two may alternate at random during the course of the intoxication. In depressive cases, the animal generally is affected for several days and becomes dehydrated and gaunt. The body temperature, respiration, and heart rate are usually depressed. Death may or may not follow. When death occurs it is usually without violence. In violent cases, death may occur a few minutes after onset of symptoms or several days thereafter. Respiration is rapid, the heart rate is increased, the body temperature may be very high, and convulsions are usually severe and often repeated.

A. Autopsy - Findings may be essentially negative but usually include cyanosis, enlargement of the kidneys and liver by congestion, together with congestion of other viscera, including the lungs. Small hemorrhages may be found along the intestinal tract, on the lungs, and most often on the heart. However these findings are not considered diagnostic of poisoning by the dip.

B. Treatment - In serious cases, efforts can be made to control the convulsions by symptomatic treatment. Consideration may also be given to removing the remaining insecticidal residue from the skin of animals showing toxic symptoms by washing with liberal use of synthetic detergents and copious quantities of water.

VII SPECIAL REFERENCE TO TREATING CATTLE WITH BHC AND LINDANE

Cattle affected with scabies are considered diseased animals and cannot be moved interstate until properly dipped and handled in accordance with current regulations. (9CFR, Part 73, as amended.)

A. Classification of Cattle

1. Cattle visibly affected by scabies, and other cattle in the same herd or consignment, shall all be classed as infected. These animals should be dipped twice, 10-14 days apart.

2. Herds from which recent shipments have been found to be infected should be carefully inspected. If infected animals are found, the herd is classed as a scabies affected herd. If no infestation is demonstrated, the herd should be considered exposed and dipped once.

3. Other cattle that may have comingled with infected animals, or that have been confined in infected cars, trucks, premises, or pens, are considered exposed and should be dipped once.

VIII HOW TO COMPUTE AMOUNTS OF WETTABLE BHC POWDER OF VARIOUS GAMMA ISOMER CONTENTS TO MAKE 100 GALLONS OF 0.075% GAMMA ISOMER DIP FOR CATTLE

% Gamma isomer content of BHC powder	Pounds required for each 100 gal. of water to initially charge vat (for 0.075%)	Pounds required for each 100 gal. of water to re- plenish vat**
5-----	12-1/2-----	13-1/2
6-----	10-1/3-----	11
10-----	6-1/4-----	6-3/4
12-----	5-1/4-----	5-3/4
25----(Lindane)-----	2-1/2-----	2-3/4

**Since the wettable powder is carried out by the animals disproportionately to the loss of water, and appreciable quantities of the powder become impounded in the dirt and other debris that accumulates in dipping operations, and an increased amount of ingredients (approximately 8%) must be used when adding water to the vat.

IX TREATING CATTLE BY SPRAYING WITH BHC AND LINDANE

Dipping is the preferred method and is usually faster, more economical, and more effective than spraying. However, scabies can be eradicated from cattle by spraying if particular care is taken to assure complete wetting of the animal.

A. Animals so treated must be properly restrained and sprayed on an individual animal basis and not by the truckload, pen full, or corral full.

B. Small hand sprayers are not satisfactory. So-called "spray dip" machines have been successfully used. A power sprayer that develops and maintains a pressure of 200 to 400 pounds per square inch, as indicated by an accurate pressure guage is required.

C. Power sprayers should be equipped with an agitator to keep the insecticide in the tank in suspension. At the beginning of operation, the spray should be directed back into the tank for several minutes to insure thorough mixing. Two operators using sprayers equipped with two hoses ordinarily are more efficient than one.

D. The operator must carefully go over the animal's body, paying attention to wetting the head, face, inside of ears, brisket, underside, between the thighs, around the scrotum or udder, and the switch of the tail. Five to seven and one-half gallons of the solution are required per animal.

E. When spraying, the operator should take care that he does not inhale an excessive amount of spray.

X SPECIAL REFERENCE TO DIPPING SHEEP AND GOATS IN BHC AND LINDANE.

Sheep and goats affected with scabies are diseased animals and cannot be moved interstate until properly dipped and handled in accordance with current regulations (9CFR, Part 74, as amended).

A. Classification of Sheep and Goats

1. Sheep and goats visibly affected by scabies, and other sheep and goats in the same flock or consignment, shall all be classed as infected. These animals should be dipped twice, 10 to 14 days apart.

2. Flocks from which recent shipments have been found to be infected should be carefully inspected. If infected animals are found, the entire flock is classed as a scabies-affected flock. If no infestation is demonstrated, the flock should be considered exposed and dipped once.

3. Other sheep and goats that may have comingled with infected animals or that have been confined in infected cars, trucks, premises, or pens, are considered exposed and should be dipped once.

Tests conducted by wool technologists have shown that treatment with these products does not injure wool or interfere with the scouring or subsequent dyeing of such wool.

XI HOW TO COMPUTE AMOUNTS OF WETTABLE BHC POWDER OF VARIOUS GAMMA ISOMER CONTENTS TO MAKE 100 GALLONS OF 0.06% GAMMA ISOMER DIP FOR SHEEP AND GOATS

% Gamma isomer content of BHC powder	Pounds needed for each 100 gal. of water to initially charge vat (for 0.06%)	Pounds needed for each 100 gal. of water to replenish vat**
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5-----	10-----	11-----
6-----	8-1/3-----	9-----
10-----	5-----	5-1/2-----
12-----	4-1/6-----	4-1/2-----
25--Lindane-----	2-----	2-1/6-----

**Since the wettable powder is carried out in the fleece disproportionately to the loss of water, and appreciable quantities of the powder become impounded in the dirt and other debris that accumulate in dipping operations, and increased amount of ingredients (approximately 8%) must be used when adding water to the vat.

XII SPRAYING SHEEP AND GOATS

Spraying of sheep and goats has been shown to be ineffective due to the difficulty of forcing the insecticide through the wool or hair